GUJARAT TECHNOLOGICAL UNIVERSITY
BRANCH NAME: B. Arch
SUBJECT NAME: Energy Efficient Architecture (Eco Niwas Samhita)
SUBJECT CODE: 2X95010
5th Year: Semester-IX

Pre requisite: The course requires basic understanding of the building materials used and the properties of the materials being used considering the appropriateness of climate, region and technologies.

Rationale: The course intends to inform and investigate the need to use alternative sources of energy in view of the depleting resources and Climate change, to get exposure on simple and passive design considerations and inform about the importance of day lighting and natural ventilation in building design, and also to make the students aware of the future trends in creating sustainable built environment.

Teaching and Assessment Scheme:

Teaching Scheme			**Credits**	**Examination Marks**				**Total Marks**	**University Exam Type**
Field work	Lectures	Studio	C	External Exam		Internal Exam		100	VIVA
1	2	1	04	(ESE) Theory	(ESE) Viva	(PA) Theory	(PA) Viva		
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Content:

SR No	Content	Total Hours	Weightage
1	**INTRODUCTION: Eco Niwas Samhita Eco Niwas Samhita –Part-1 (Building Envelope):** Eco niwas samhita- Part -1 was launched in 2018, to set minimum building envelope performance requirements in **Residential Buildings** to limit heat gains (for cooling dominated climates) and to limit heat loss(for heating dominated climates)as well as for ensuring adequate natural ventilation and daylighting potential.	12	20%
2	**Eco niwas Samhita 2021(Code compliance and part-II: Electro Mechanical and renewable energy systems)** Eco niwas samhita 2021 was launched by **Ministry of Power** in July 2021. This code specifies code compliance approaches and minimum energy performance requirements for building services, indoor electrical end-use and renewable energy systems.	12	20%
3	**Residential Buildings: Past and Present:** Reviewing Buildings in past and present, The materials used natural ventilation and vegetation, Glazed area, shading devices and techniques, thermal comfort, use of air conditioning and energy consumption, as well as climatic considerations taken in the buildings in past and in current.	08	10%
4	**Need of Shift on energy efficiency:** Rapid Urbanisation, Improved lifestyle, affordability of technologies, Aesthetics, Increased cost of Properties, and therefore Drastic increase in energy consumption.	08	10%

5	**Assessing the ways to reduce energy consumption through architecture:** 1. Significance of Energy Efficiency in the contemporary context, Simple passive design Considerations involving Site Conditions, Building Orientation, Plan form and Building Envelope 2. Heat transfer and Thermal Performance of Walls and Roofs Direct Gain Thermal Storage of Wall and Roof - Roof Radiation Trap - Solarium 3. Isolated Gain Evaporative Cooling –Nocturnal Radiation cooling - Passive Desiccant Cooling 4. Induced Ventilation - Earth Sheltering - Wind Tower - Earth Air Tunnels Daylight Factor - Daylight Analysis - Daylight and Shading Devices 5. Types of Ventilation - Ventilation and Building Design. Areas for innovation in improving energy efficiency such as Photo Voltaic Cells, Battery 6. Technology, Thermal Energy Storage, Recycled and Reusable Building materials, Nanotechnology, smart materials and the future of built environment, Energy Conservation Building code.	12	20%
6	Related Case studies (Eco niwas samhita) analysis and Detailed Report Presentation.	12	20%

*: indicative

References:

1. Manual on Solar Passive Architecture, IIT Mumbai and Mines New Delhi, 1999
2. Arvind Krishnan• & Others, "Climate Responsive Architecture", A Design Handbook for Energy Efficient Buildings, TATA McGraw Hill Publishing Company Limited, New• Delhi, 2001
3. Majumdar M, "Energy-efficient Building in India", TERI Press, 2000.•
4. Givoni .B, "Passive and Low Energy Cooling of Buildings", Van Nostrand Reinhold,• New York, 1994
5. Fuller Moore, "Environmental Control Systems", McGraw Hill INC, New Delhi – 1993
6. Sophia and Stefan Behling, Sol power, "The Evolution of Solar Architecture", Prestel, Patrick Waterfield, "The Energy Efficient Home: A Complete Guide", Crowood press• ltd, 2011. Dean Hawkes, "Energy Efficient Buildings: Architecture, Engineering and Environment",
7. W.W. Norton• & Company, 2002 David Johnson, Scott Gibson, "Green from the Ground Up: Sustainable, Healthy and• Energy efficient home construction", Taunton Press, 2008

List of Projects/Assignments*:

Lectures/Tutorial work shall consist of presentations on various topics of the subject. AV projects may beintroduced to students for documenting best practices and advances through case studies. A group discussion orforummaybeorganized fordiscussion on variousaspects of the subject.

*- this is suggestive for common purpose. Faculty may decide on this, considering student group and institutionphilosophy.